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MAY, 1922

NO. 3



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NORTH CAROLINA HIGHWAY BULLETIN



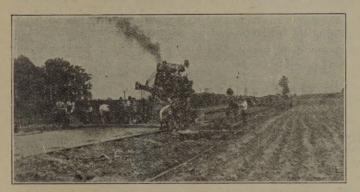
Vol. III, No. 3

H. K. WITHERSPOON, Editor

MAY, 1922

Charlotte-Statesville Highway Under Construction

EVERAL YEARS AGO the mention of hardsurfacing a single stretch of highway thirty-eight miles long would have been considered a rash statement to say the least and even today when everyone is interested in highway work it is somewhat unusual, in this State at any rate, to see a road of this length in process



LAYING CONCRETE BASE COURSE

of being paved. As indicated by the above caption this road extends from the northern city limits of Charlotte to the corporate limits of Statesville and forms a very important link in route No. 26. On the southern, or Charlotte end of the road it connects with route No. 20, the Wilmington-Charlotte-Asheville Highway, which extends across the State along its southern border while at Statesville it connects with route No. 10, the Central Highway, with the Lenoir-Blowing Rock road, and with the Mocksville-Winston-Salem road. It will readily be seen that besides being an important highway from the standpoint of local travel, since it connects two of the leading cities of the State, it also forms a connecting link between the main highways of North Carolina.

For construction purposes the road is divided into four projects namely, Project 639, 10.6 miles long which extends from Statesville to Sheppard; No. 638, extending from Sheppard to the Mecklenburg County line, a distance of 7.88 miles; Project 654, from the county line 10.1 miles towards Charlotte; and Project No. 653 from this point to the city limits of Charlotte. All of

the projects will be of the same type of construction, asphaltic concrete surface on a base course of plain cement concrete, and are 18 feet in width. The alignment of the new highway follows in a general way closely to the location of the old road which has been in use for a number of years. There are several changes in the location, however, which materially shorten the distance between the objective points and, what is of vastly more importance, eliminate eight grade crossings between Statesville and Charlotte. The new location runs practically parallel to the Southern railroad throughout the entire line, crossing only when absolutely necessary, while the old road fairly wove its way back and forth across the tracks.

R. M. Hudson & Co., of Salisbury were awarded the grading and surfacing on Project No. 639, while the structures are being built by the Luten Bridge Co., of Charlotte. Construction was begun on Jan. 2nd, and at the present time is approximately 14% complete. This section of the highway will cost when completed approximately \$387,500.00.

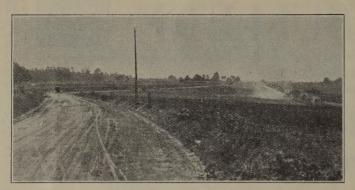
Project No. 638, the second in the chain making up this highway, is being constructed by the Thompson-Caldwell Co., of Charlotte. The work that is being done on this project is above the average and an excellent



A WELL LAID CURVE ON PROJECT 638

finish has been secured on the portion which has been completed. The public usually judges a road by its

riding surface and in this case the most critical should be pleased. If the entire highway is constructed according to the standard set on this project it will be one of the best, if not the best, example of this type of construction in the State. Construction was begun



A SAVING IN DISTANCE BY RELOCATION—NEW ROAD MAY BE SEEN ON RIGHT

38% complete. The work will cost in round figures \$262,000.

Lampton & Burks, of Louisville, Ky., who have the contract for Project No. 654 have done no paving work so far, their activities since work began on April 3rd, being confined to clearing right-of-way and grading work. The 10.1 miles included in this contract will cost on this project on October 12, 1921, and to date is

approximately \$303,000 and will require two hundred and fifty working days for completion.

Grading work was begun on Project 653 on February 28th by the Union Paving Co., of Philadelphia, while the Luten Bridge Company began work on the bridges on January 16th. This project will cost \$308,000 for the 8.84 miles included.

The average layman does not stop to consider the vast amount of material that is required to construct a hard surfaced highway of this length and a few figures will doubtless be interesting. Considering only the main items entering into the construction of a highway of this type and length, on these four projects making up this highway, 166,000 cubic yards of earth will be moved and drainage pipe of various sizes aggregating over a mile in length will be laid before any pavement is laid. To form a base course for the asphaltic concrete wearing surface approximately 395,000 square yards of cement concrete pavement will be laid. Using a 1:21/2:5 mix as specified this will require, in approximate figures, 65,840 barrels of cement, or 951 cars; 25,240 cubic yards of sand; and 49,900 cubic yards, or 62,500 tons of crushed stone. To lay the bituminous wearing surface 350,740 square yards of asphaltic concrete will be required. Careful inspection is made of every detail of construction to insure the best possible work.

How Does It Ride?

OMPARATIVELY few people who use our highways are sufficiently well versed in the technique of road construction to know whether or not a highway was constructed under the most approved specifications. In the absence of any obvious defects, the average motorist's opinion of a highway is summed up in his answer to the question "How does it ride?"

Engineers and contractors, on the other hand, have in the past directed their attention to getting the proper amount of cement into the pavement, cutting down the amount of mixing water, adequately preparing the subgrade and other technical details in which the average user of the highways took little interest. But with the present universal interest evidenced in highway matters, the motorist is learning more of the engineering side of highway construction and the road builder is, to a greater degree than before, considering the motorist's point of view. The need for great care in securing an even, true riding surface is being recognized by highway builders to an increasing degree. Many states now specify the allowable surface variation in a certain gauge length from a straight line. Some states require the use of split floats at joints, finishing with special tools and careful testing of the finished pavement with a straight edge to insure an even contour.

It is not enough that the pavement be made of good concrete. For maximum comfort, economy in operation and durability of the pavement itself, the surface must be free from irregularities. Recent experiments indicate the importance of an even riding surface from other considerations than the comfort of the motorist. Tests made by the U. S. Bureau of Roads have already shown that the impact of truck wheels caused by comparatively small surface irregularities produces very high stresses in comparison with those of static loads only. Other tests now under way indicate that tractive resistance depends largely upon the surface and material of the road. Here is one place where tractive resistance, already very low on concrete pavements, may be made still lower by good construction.

The common methods of finishing a concrete road usually result in a surface free from noticeable bumps and depressions. Further, this material has the great advantage of remaining in its original condition, unaffected by temperature or by traffic. There is still room for improvement: sufficient attention to forms, uniform consistency, finishing methods and testing the surface must be given to insure a truly even pavement.

Maintenance of Gravel Roads

By E. R. OLBRICH

Construction Engineer North Carolina Highway Commission

F THE TOTAL MILEAGE of surfaced roads in the United States, that is, roads other than earth roads, nearly one-half, or about 150,000 miles, is surfaced with gravel. It will be readily appreciated from this that an adequate knowledge of the most practical and economical methods and materials for gravel road maintenance is an essential part of a satisfactory highway program.

Many thousands of miles of gravel road are being constructed today, and gravel roads will continue to be constructed in the future on highways of secondary importance, where the traffic is such as not to warrant a more permanent type of road, or where the funds available will not permit it. In those states where the deposits of good road-building gravel are common, it would indeed be a short-sighted policy of the highway authorities not to avail themselves of the material made so readily and cheaply available by the forces of nature. In gravel road construction the two chief cost factors, labor cost of preparation and transportation of the road surfacing material, are comparatively low. Much of the preliminary work of crushing and grading, which is necessary in the case of a broken-stone road, has already been done for the road builder in the case of gravel roads, and often the only transportation involved is the hauling of the gravel from the nearby pit to the road.

The gravel road is easily and cheaply constructed and with good drainage and light traffic is easily and cheaply maintained. It is ideal for horse-drawn traffic and before the advent of the automobile a well constructed gravel road satisfactorily met the needs of the traffic on the average highways of that day. But with the constantly increasing motor vehicle traffic of today, the gravel road is subjected to destructive actions, the correction or elimination of which has not been entirely solved.

The gravel roads of the state may be divided into three classes, depending on the amount of traffic carried.

- (1) Primary or Trunk-Line Roads which constitute the main through arteries of the state and which carry the heaviest traffic.
- (2) Secondary Roads which connect up towns and villages and primary roads but do not carry the volume of traffic or the heavy vehicular traffic carried by the primary roads.
- (3) Tertiary Roads or local roads, which carry local traffic and act as feeders to the secondary or primary roads.

The question of the type of surface for these three classes of roads is an economic one and must be considered upon the basis of the cost of maintenance of various types of road surfaces when considered over a term of years.

- (1) A gravel road wide enough to permit two lines of traffic can be satisfactorily maintained (assuming proper drainage) as an untreated road with a traffic up to 300 or 500 vehicles per day. Consideration of dust prevention, however, would probably require the adoption of a dust layer before this amount of traffic was reached.
- (2) A gravel road with a traffic up to 1200 or 1500 vehicles per day may be satisfactorily maintained (always assuming proper drainage) by the use of a surface treatment to preserve the road surface and eliminate the dust nuisance.
- (3) In general, it may be said that a gravel road with a traffic exceeding 1500 vehicles per day or what would constitute the primary or trunk roads cannot be economically maintained as a gravel road even with the use of a surface treatment. This is particularly true where the traffic is largely composed of high-speed touring cars, as this class of traffic is more destructive to the gravel road in dry weather, than the heavier but slower moving trucks. There are records of gravel roads with a traffic of 2400 vehicles per day which were maintained in good surface by means of surface treatments, but the annual cost of maintenance was such as to approach or exceed the annual cost of a concrete, brick or other high type of improved surface.

We will assume, therefore, that those gravel roads which, because of the heavy traffic carried, are classed as primary roads will be paved with concrete, brick, or some other higher type of hard surface road, and thus be eliminated as a gravel road maintenance proposition.

We have said that the third class or local gravel roads carrying only a light traffic can be maintained without the use of a surface treatment. This leaves then the secondary class of roads which can be economically maintained as gravel roads by the use of a surface treatment. Many roads of the primary or heavy traffic class, which will ultimately be paved with brick or concrete, will necessarily have to be maintained, as gravel roads by the use of a surface treating material until such time as the money is available, or until other conditions permit the improvement. The problem now resolves itself into a choice of the most practical and economical maintenance material for the surface treatment of gravel roads.

(Continued on page 9)



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RALEIGH, NORTH CAROLINA

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Address all communications in regard to Bulletin to the Editor, Box 1140, Raleigh, N. C.

This BULLETIN will be sent gratis to any State or county official, contractor, newspaper, trade publication, library, or other person interested in the improvement of roads and in the work of the Commission. Advertising rates may be obtained on application.

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May, 1922

Number 3

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Editorial

North Carolina's reputation as a road building state is fast spreading and almost every month brings highway officials from other states to inspect the work that is being done on the State Highway System. Recent visitors of note were Col. W. D. Uhler, chief engineer of the Pennsylvania State Highway Commission, and Col. Geo. P. Coleman, of the Virginia State Highway Commission. While in the State these gentlemen made a thorough inspection of the work that is in progress throughout the State. Pennsylvania is perhaps the leading state in the Union in highway work while Virginia is getting on her feet to begin an extensive program. It was a pleasure to have these gentlemen in our State and to have the opportunity of showing them over the State roads.

Calcium Chloride, in chemical parlance known as Ca Cl, has been used with marked success in several states as an agent in the maintenance of gravel roads and experiments are now in progress, as described elsewhere in this issue, which will determine whether or not it is suitable for use on North Carolina's gravel and topsoil roads. The chemical has the property of absorbing and holding moisture thus keeping the surface of the road damp at all times thereby preventing the dust nuisance and the loss of the fine material which forms part of the road bed. If the experiments prove a success, as it appears that they will, an appreciable saving in maintenance will be effected by the use of it since a large portion of the state system is of the gravel type.

The cover sheet this month carries a photograph of a section of the Statesville-Charlotte Highway, Route 26, which is now under construction. This particular view was taken on Project No. 638, and is a model piece of finished asphaltic concrete construction. A description of this work is to be found in this issue of the Bulletin.

The Division of Tests and Investigations of the State Highway Commission is one of the most important branches of the Department and has been the means of saving thousands of dollars to the State. In next month's Bulletin there will appear articles describing the two laboratories of this division and which will be illustrated with photographs showing how the materials going into North Carolina roads are tested.

Concerning Detours

NE OF THE NECESSARY evils that go with a large road building program, such as that now in progress in North Carolina, is the fact that the motoring public must of necessity use detours or little travelled side roads. That this is an inconvenience everyone will admit but without a certain amount of inconvenience road and bridge construction cannot proceed and the annoyance of having to detour must be borne with as much patience as possible by all concerned.

and roads of the state. It is not sufficient to place a sign at either end of the detour if it is of any length but a standard guiding marker should be placed at every crossroads, every road fork, or in short at every point where there could be the slightest possibility of a doubt arising as to the proper route to be followed. If there are any bridges on the detour that are safe only for a limited load they should be so marked. The kind of sign not to use is shown in the photograph accompanying

The State Highway Commission is putting forth every effort to keep all detours in as good condition as possible within a reasonable cost limit and specific instructions have been issued to the district engineers, and through them to the resident engineers, that all detours must be kept in a passable condition or better than that if possible. A certain amount of criticism has been directed to the Commission in regard to detours, and some of it no doubt rightfully, but the engineers are not entirely

to blame in every instance. It has been the earnest endeavor of the Commission to have every detour so marked that there can be no mistaking the route that should be followed but in spite of this there are always some travellers, who, instead of following the detours marked and maintained by the Commission, depend on local information from someone who either is unfamiliar with the proper route or who wilfully misdirects the trav-

eller. Several instances of this have been brought to the attention of the Commission and invariably the blame misplaced.

There are two points of special importance in connection with detours which should be of interest and which should be observed by every engineer of the Commission who is in any way connected with construction work and the attendant detours. The first of these is keeping the road in as good condition as is reasonably possible, and the second is the careful marking of the detour. It is hard to say just which is the more important of the two but from the observation of the writer a fairly well maintained detour carefully posted with signs is to be preferred over an excellently maintained detour with few or no detour signs. There is nothing more confusing or annoying than to be forced to detour on a strange road and except for the sign where the main highway is left to find no signs along the detour and this is particularly true of night driving. The detour, preferably, should be both well maintained and well marked but above everything well marked. In posting these signs the engineer should place himself in the position of the traveller who is forced to use the detour, considering that he is entirely unfamiliar with the routes

sign at either end of the detour if it is of any length but a standard guiding marker should be placed at every crossroads, every road fork, or in short at every point where there could be the slightest possibility of a doubt arising as to the proper route to be followed. If there are any bridges on the detour that are safe only for a limited load they should be so marked. The kind of sign not to use is shown in the photograph accompanying this article. It is reproduced here not to show the lettering for that could scarcely be read on the original, having been done with a pencil on a piece of brown pasteboard, but as an example of how carelessly some detours are marked. Standard markers are provided by the Commission and these should be used. The illustration on page 8 shows the sheet of standard detour signs which are to be used on all detours on the State Highway System. Sign No. 1, made up according to

specifications shown, is to be used at the beginning and ending of the detour; No. 2, as indicated, is to show the traveller when a certain point has been reached; and No. 3 at intervals along the detour to prevent any mistaking of the route. (Resident Engineers who do not have a print of this sheet of standards may secure same through their District. Engineer.)

Along with the criticism that has been directed at



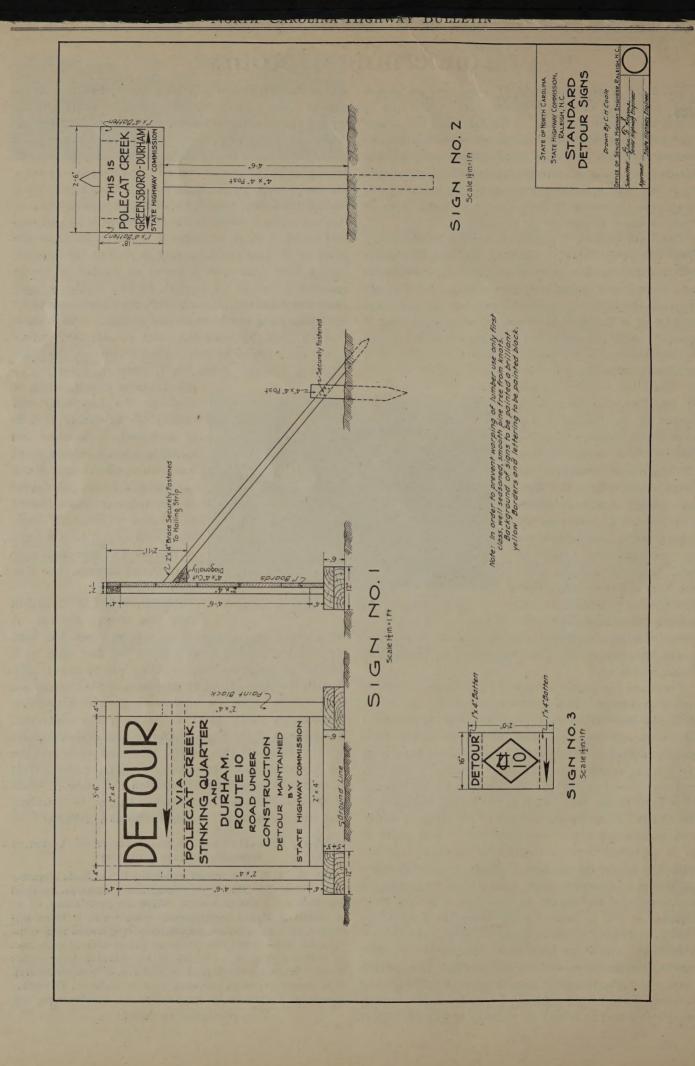
DETOURS SHOULD NOT BE MARKED AS ABOVE

the Commission in regard to detours there has been considerable trouble arising from the fact that in a number of instances the travelling public utterly disregards the signs placed by engineers of the Commission and wilfully drive on new work thereby oftentimes necessitating doing part of the work a second time. The authors of the State Highway Law evidently foresaw that this very thing would occur and wrote into the law a section which specifically covers the ease. This is contained in section 12, entitled, "Closing of State Highways During Construction, Injury to Barriers, Warning Signs, Etc.," and which reads as follows:

CLOSING OF STATE HIGHWAYS DURING CONSTRUCTION, INJURY TO BARRIERS, WARNING SIGNS, ETC.

Sec. 12. If it shall appear necessary to the State Highway Commission, its officers, or appropriate employees, to close any road or highway coming under its jurisdiction so as to permit of proper completion of work which is being performed, such commission, its officers or employees, may close, or cause to be closed, the whole or any portion of such road or highway deemed necessary to be excluded from public travel. While any such road or highway, or portion thereof, if so closed, or while any such road or highway, or portion thereof, is in process of construction or maintenance, such

(Continued on page 9)



The Maintenance of Gravel Roads

(Continued from page 5)

Dust prevention on gravel roads is a very important problem confronting those states having a large mileage of gravel roads. The economic solution of this problem is made imperative by two important considerations, first, that of the public health, safety and comfort; second, that of the preservation of the road surface.

The menace to the public health, to say nothing of the discomfort to the public, caused by the dust nuisance which is so general in the dry summer months on our untreated gravel roads, is one that calls urgently for an economic solution. Not only is there a menace to the health of the users of the road, but also to the property owners of the community which the road traverses. The damage resulting to the clothing of passengers, to vehicles on the road, and to property along the roadside would, if it could be determined, make a very considerable item, the saving of which in itself would warrant a considerable expenditure for its prevention.

The danger to the public safety resulting from the obscuring, in clouds of dust, of fast-moving vehicles on the road, is another very real evil of the dust nuisance. With only one or two vehicles on the road there is very little danger from this source, but when the traffic is both heavy in volume and fast-moving, the dust cloud forms an effectual screen which obscures other vehicles, and leaves traffic at the mercy of the reckless driver or the "road-hog." Inasmuch as this danger is greatest when the traffic on the roadway is heavy and when all other elements of traffic danger are greatest, this is no slight consideration. We expend considerable sums to eliminate dangerous curves and sharp turns, and are

justified in expenditures to increase the clear sight around turns in the road, but a dust cloud may render ineffectual these precautions.

Preservation of the gravel road surface is linked up very closely with dust prevention on gravel roads. The dust coming from gravel roads is composed chiefly of the fine particles of the binding material in the gravel. If this material can be kept in its original place in the road crust we will have little or no dust in the air. It is also essential that this binding material be kept in place in order to preserve the road. Therefore if we can keep this fine portion of the binding material on the road surface and in place we will have accomplished both the elimination of the dust and the preservation of the road surface.

There are two general methods of treating the surface of gravel roads.

There are two classes of materials used in treating the surface of gravel roads to overcome the dust nuisance and to maintain the surface. The first class includes bituminous materials, tars and asphalts which are applied to the surface in liquid form to obtain a coating or blanket over the surface which confines the fine particles of road material in place. The second class contains the hydrographic and deliquescent salts which by storing sufficient moisture in the road surface have the same effect in holding down the fine material in place as a light shower of rain or sprinkling the road with water. Calcium chloride is practically exclusively used for this purpose. A discussion of calcium chloride is contained elsewhere in this bulletin.

Concerning Detours

(Continued from page 7)

commission, its officers or appropriate employees, or its contractor, under authority from such commission, may erect, or cause to be erected, suitable barriers or obstructions thereon, may post, or cause to be posted, conspicuous notices to the effect that the road or highway, or portion thereof, is closed, warning signs, lights and lanterns on such road or highway, or portions thereof. When such road or highway is closed to the public or in process of construction or maintenance, as provided herein, any person who willfully breaks down, drives into new construction work, removes, injures or destroys any such barrier or barriers or obstructions on road being constructed, or tears down, removes or destroys any such notices, drives into new construction work, or extinguishes, removes, injures or destroys any such warning lights or lanterns so erected, posted or placed, shall be guilty of a misdemeanor.

From a careful reading of the above it will be seen that the blame rests solely upon the traveller who willfully drives past a detour sign or barrier and, in addition to the risk of wrecking his car and possibly fatal injuries to himself, he is liable to prosecution.

The whole question of making the best of the detours goes back to cooperation of the travelling public with the engineers of the State Highway Commission. Detours are not made for the purpose of inconveniencing the public,—it is safe to say that engineers of the Commission are forced to use them more than any other class,—but in order that road construction may be carried on more efficiently and to a quicker end. It is the desire of the Commission to keep every detour in the best reasonable condition and any complaint regarding any which are not properly marked or kept up should be made to headquarters and the matter will be immediately investigated.

THE THE WAY DULLETIN

Calcium Chloride Experiment

State Highway Commission Experimenting with Calcium Chloride

T IS DESIRED to call the attention of the maintenance engineers in particular and the highway commission in general, to an experiment with calcium chloride for dust laying and maintenance of gravel, sand-clay and top-soil roads.

Three half-mile sections of road, one each of gravel, sand-clay, and top-soil have been selected near Raleigh for experimental treatment with calcium chloride. The gravel road section is on the Cary Road and extends through the town of Cary. The sand-clay section is on the Wendell road just east of the corporate limits of Raleigh. The top-soil section is on the Fuquay Springs road beyond the experimental bituminous sections south of Raleigh. The first application of calcium chloride has been made on these sections and successive

treatments will be made as deemed necessary.

Calcium chloride has been used extensively on gravel roads with considerable success in other states, but its use on sand-clay and top-soil roads has been very limted so that the development of the experimental stretches on these types of roads will be watched with interest. The experiment is being conducted by the Division of Tests and Investigation under the direction of E. R. Olbrich, Construction Engineer.

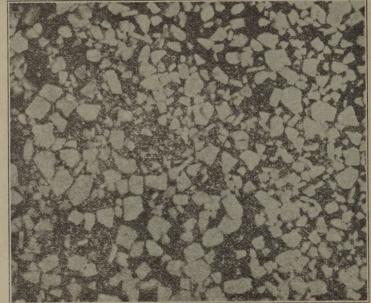
of ten years in increasing amounts until at this time it is the generally accepted maintenance material for gravel roads in that state.

In the early use of calcium chloride it was shipped in

In the early use of calcium chloride it was shipped in liquid form in tank cars and applied to the road by sprinkling wagons. In more recent years it has been produced in the granular and flake forms. The flake form is best suited to road work, as it is possible to ship it in moisture-proof sacks of 100 pounds weight. In this form the material may be more easily handled and may be stored like cement until ready to be used, thus eliminating demurrage on tank cars.

When applied to the gravel road surface the individual flakes of calcium chloride attract and hold moisture, melting down into the road surface, leaving it with a

> damp appearance exactly as if a light rain had fallen. By storing a sufficient amount of moisture in the road surface it holds down the fine material which produces the dust nuisance, at the same time preserving the road surface by keeping the fine material in place on the road. It will be noticed on the gravel road treated with calcium chloride that, under the action of traffic, the gravel will pack down into a smooth firm surface. With repeated applications, and as the calcium chloride works into the surface, this result



CALCIUM CHLORIDE CRYSTALS
(Natural Size)

Calcium Chloride

Calcium chloride is a white deliquescent salt, and is obtained from two sources, namely,

- (1) as a by-product in the manufacture of soda-ash,
- (2) from the salt brine pumped from underground streams in regions of salt deposits.

The term "deliquescent" is applied to those salts which have the power of absorbing moisture from the air to such an extent that they are completely dissolved in the water thus formed.

Calcium chloride as a dust layer and maintenance material for gravel roads is not a new or experimental project. Connecticut which has a large mileage of gravel roads has used it successfully for many years. Leroy Ulrich, Maintenance Engineer of the Connecticut State Highway Department, has written many articles on its use on gravel roads. The Bureau of Public Roads, Washington, D. C., issues publications which deal with the use of calcium chloride on gravel and macadam roads. Michigan has used calcium chloride for a period

will become more evident. It will, however, not produce a hard crust or mat which later breaks through in numerous places, forming pot-holes and producing a very rough condition of road surface. Whenever necessary the gravel road surface treated with calcium chloride may be floated over with a drag, as there is always a sufficient amount of moisture present to make dragging effective at any time. The ease with which a smooth surface may be maintained on a gravel road with the use of calcium chloride and occasional dragging is one of the most important and unique features of the material, and one which appeals to the gravel road maintenance man.

Calcium chloride is more easily and cheaply applied, and can be successfully applied under less restrictions as to weather conditions and character of road surface than any other material, but there are certain limitations to the use of the material which should be understood.

The surface of the road should be such that it will assist the calcium chloride in retaining the moisture attracted by it. For that reason, it is not advisable to apply it to a gravel road which has been previously treated with oil, until such time as the oil has lost its



SPREADING CALCIUM CHLORIDE WITH LIME SPREADER

effect, and will no longer prevent the absorption of the calcium chloride into the road surface.

The question is often asked, "What is the effect of rain on a calcium chloride treatment?" Experience has shown that the calcium chloride is not washed from the gravel road surface by the rain, but rather it is absorbed into the surface like a blotter.

Calcium chloride in the flake form is easily and cheaply applied to the road by means of a line spreader. The usual method is to load the material in sacks into a three or five ton truck which has a lime spreader attached on the rear. A two-man crew is sufficient, one man driving the truck and the other man opening the sacks and feeding the material into the spreader. Ten miles, or more, of sixteen foot gravel road may be thus treated per day if the material is so located as to eliminate the necessity of the truck making long hauls.

In applying the material, the road should be shaped up in the spring after the frost is out of the road. Two treatments of calcium chloride are sufficient for the average gravel road in the northern states and will cost from $2\frac{1}{2}$ cents to $3\frac{1}{2}$ cents per square yard, applied on the road, or at the rate of \$250.00 to \$350.00 per mile of 16 ft. road, per season, varying somewhat with the freight rate and local conditions. In the southern states with a longer and hotter summer three treatments per season will probably be necessary. The repeated applications are not objectionable as each application is quickly and cheaply made, and it is not necessary to close the road to traffic during the application.

Calcium chloride is odorless and not objectionable from the standpoint of being tracked into the house or damaging the clothing of pedestrians. It has no effect on rubber tires. Laborers should wear canvas gloves and rubber boots in handling the material. If a lime spreader is used for applying the material it should be washed free of the salt after using, and the metal parts lightly coated with a thin oil to prevent corrosion.



RIGHT HAND HALF OF ROAD HAS BEEN TREATED WITH CALCIUM CHLORIDE



SWIFT ISLAND BRIDGE-LOOKING UPSTREAM

STATUS OF FEDERAL AID WORK IN NORTH CAROLINA Projects Under Construction

NO.	COUNTY LENGTH T E		APPROXIMATE COST BEGUN		CONTRACTOR		
4	Craven	9.46	G	\$ 21,089,23	10-12-19	County Commissioners.	
13	Wayne	12.573	Ğ	101,467.23	5-25-20	County Commissioners.	
15	Guilford	4.205	H	5,441.75	9-1-17	County Commissioners.	
16	Havwood	14.27		64,705.05	726-19	County Commissioners.	
17	Wilkes	17.6	G G	101,386.08	10-15-18	County Commissioners.	
58	Johnston	6.018	G G	69,453.50	5-20-20	P. R. Ashby.	
61	New Hanover		G	234,841.39	7-12-20	C. W. Lacy.	
66	Haywood	6.18	Ğ G	105,296.45	91520	O'Brien Construction Co.	
68	Sampson-Harnett	27.4	G	305,225.54	7-23-20	P. R. Ashby—F. L. Grant, Inc.	
69	Transylvania	9.348	G	231,409.04	3-25-20	Allport & Alexander Construction Co.	
70A	Jackson	4.83	G	150,081.11	8-18-20	Wright & Nave.	
75	Columbus	7.06	G	66,605.38	12-9-20	County Commissioners.	
86A	Martin-Bertie	3.09	G	98,454.67	″ 2-25-20	State Forces.	
86B	Martin-Bertie		Bridges	332,308.83	3-19-21	Boyle-Robertson Construction Co.	
93	Franklin-Warren	19.8	G	192,993.57	9-25-20		
94A	Mitchell	5.04	HS	190,375,13	6-22-20	Gibson Construction Co.	
98A	Moore	20.53	G G	259,240.38	9-10-20	J. T. Plott—J. E. Lane & Co.	
99B	Chatham	21.82	G	259,931.59	11-19-20		
101B	Randolph	9.64	G G	107,928.75	11-5-20		
117	Wilson	6.25	G	41,828.93	38-21		
120	Bladen		G G	105,688.55	2-16-21	J. A. Marrow—P. R. Ashby.	
125A 127	Alleghany	7.63	G	153,899.13	11-22-21	W. E. Graham. County Commissioners—Lee J. Smith.	
136	Wilson Davie		G	33,780.45	3-5-21		
190	Davie	0.99	G	61,733.04	2-14-21	Chandler & Ragland—Hagedorn Const. Co.	

Projects Completed

NO.	O. COUNTY LENGTH TYPE		APPROXIMATE COST	COMPLETED	CONTRACTOR		
110.	COUNTI	DENGIH	1111	ATTROXIMATE COST	COMIDEIED	CONTRACTOR	
1*	Mecklenburg		Bridge	\$ 59,224.90	9-5-18	C. W. Requarth & Co.	
$\overline{2}^*$	Henderson		G	33,141.74	12-17-19	State Convict Labor.	
3*	McDowell	2.85	Ğ	24,405.73	12-17-19	County Commissioners.	
5*	Burke	8.03	Ğ	19,888.05	11-1-19	County Commissioners.	
8*	Cumberland	13.46	Ğ	62,800.71	6-20-21	County Commissioners.	
9*	Polk	12.78	G	68,175.45	4-15-21	County Commissioners.	
11*	Lenoir	1.78	HS	56,893.18	1-25-21	West Construction Company.	
12*	Wayne		G	26,727.98	11-2-20	County Commissioners.	
14*	Halifax	8.01	· G	19,017.83	8-20-29	State Convict Labor.	
18*	Alexander	9.8	G	66,446.49	3-31-21	County Commissioners.	
19*	Rockingham	8.21	G	32,759.36	11-11-19	County Commissioners.	
20*	Yadkin	6.41	G	25,146.45	7-26-20	County Commissioners.	
21*	Person	7.675	G ·	25,911,04	3-15-20	County Commissioners.	
22A*	Alamance	1.196	HS	30,103.48	6-27-19	County Commissioners.	
22B*	Alamance	8.3	HS	290,179.36	8-19-21	Powell Paving and Construction Co.	
23*	Burke	7.68	G	42,873.90	11-1-20	Lovelady Township Forces.	
24*	Wake	4.24	HS	127.840.21	11-30-19	W. W. Boxley & Co.	
25*	Person		G	101,537.51	10-20-20	County Commissioners.	
26*	Davidson		G	14,115.96	10—1-19	County Commissioners.	
27A	Orange	8.235	G	53,945.73	4-23-21	W. S. & L. A. Crawford.	
29*	Union	8.655	G	58,949.25	4-8-21	County Commissioners—J. S. Stearns.	
30	Mecklenburg	6.304	HS	102,551.35	3-31-21	County Commissioners.	
31*	Buncombe	3.1	S	70,174.88	10-24-19	County Commissioners.	
33	Montgomery	3.72	्र	15,246.71	6-8-21	County Commissioners.	
34	Wayne		.dge	50,798.00	10-8-21	Roanoke Bridge and Iron Works, Inc.	
35*	Forsyth	1.87	H S H S	59,867.61	2-25-20	County Commissioners.	
36*	Durham	3.40	H S	115,075.57	12-15-19	R. G. Lassiter & Co.	
37	Gaston	10.38	HS	167,173.23	12-28-21	County Commissioners.	
38*	Rockingham	10.92	G .	46,809.92	9-17-20	County Commissioners.	
38A	Caswell	6.67	· G	50,907.23	76-21	Bolton Construction Co.	
39	Union		G	74,337.71	4-9-21	County Commissioners—J. S. Stearns.	
40*	Union	4.287	G	18,434,20	12-11-20	County Commissioners.	
41	Watauga	8.95	G	94,681.29	11-10-21	County Commissioners.	
42*	Stanly	11.07	G	80,922.15	9-10-20	Gibson Construction Co.	
43*	Beaufort		HS	95,089.12	5-11-20	Simmons Construction Co.	
44*	Granville Buncombe		· G Н S	51,377.43	4-20-21 7 -23-21	T. W. Chandler—P. R. Ashby.	
45	Duncompe	7.802	пь	359,777.28	7-25-21	H. A. Wells-Asheville Const. Co.—Asheville Paving Co.	
47*	Guilford	4.607	н .	162,689.83	4-8-21	County Commissioners.	
48A*	Northampton		G	60,620.51	10-30-20	Virginia Contracting Co.	
48B	Northampton		G .	44,749.65	10-30-20	Porter & Peck—A. C. House.	
45D 49	Lenoir	6.017	H S	199,872.19	6-1-21	T. H. Gill & Co.—West Construction Co.	
50*	Guilford	2.65	HS	101,596.44	12-31-20	County Commissioners.	
51	Guilford	$\frac{2.05}{2.26}$	HS	87,603.12	9-27-20	County Commissioners.	
52	Cabarrus		G.	162,399.61	3-22-21	Gibson Construction Co.—J. E. Lane.	
02	Canali and	0.000	4.	102,000.01	0 44 41	Gibson Constitution Co. V. 11. Danie.	
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STATUS OF FEDERAL AID WORK IN NORTH CAROLINA---Continued. Projects Completed, (Continued.)

COUNTY	LENGTH	TYPE	APPROXIMATE COST	COMPLETED	CONTRACTOR
Wake Mecklenburg Forsyth Rowan Columbus Lenoir_	6.811 H S 6.008 H S 4.59 H S 5.868 G 6.75 G 11.025 G 7.88 H S		\$ 246,838.20 239,736.26 196,899.73 188,445.18 47,709.31 72,549.27 106,872.26 259,445.25	21021 82320 122820 81321 102920 42221 12622 40022	T. H. Gill & Co.—West Construction Co. R. G. Lassiter & Co. Simmons Construction Co., Inc. Simmons Construction Co., Inc. C. B. Hester—Luten Bridge Co. W. E. Graham—R. M. Hudson Co. County Commissioners. T. H. Gill & Co.—West Construction Co.
Buncombe	3.76	HS	167,933.55	92021	H. C. McCrary, Inc.—Asheville Construction Co Allport & Alexander Construction Co.—H. C. McCrary, Inc.—Asheville Paving Co.
Nash	8.81 6.69 3.896 8.73 2.803 4.92 1.35	H S H S G G G G H S	384,126.08 319,153.39 70,470.89 159,913.16 25,537.45 63,411.26 54,583.76	4-20-21 10-26-21 3-4-21 4-10-22 8-20-20 521 10-29-20	Porter & Peck. R. G. Lassiter—Atlantic Bridge Co. State Forces. Gibson Construction Co.—J. A. Kreis & Co. Porter & Boyd. County Commissioners. County Commissioners. R. M. Hudson & Co.
Rutherford Rutherford Cleveland Montgomery Montgomery Pender	$egin{array}{c} 9.64 \\ 10.26 \\ 1.645 \\ 16.6 \\ 11.07 \\ 26.11 \\ \hline \end{array}$	G G H S G G G	88,230.71 71,056.48 67,063.64 226,516.20 65,145.02 273,439.45	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	E. T. Belote. Ross Brothers. Ralph E. Oliver. Noll Construction Co. County Commissioners. Lee J. Smith Const. Co.—P. R. Ashby. Porter & Boyd. Heilig & Sherrill.
Burke-McDowell_ McDowell_ Davie Pamlico Surry Yancey	8.33 6.76 8.28 12.03 10.68 10.38 2.95	G G G G	128,193.76 109,659.49 58,756.89 127,981.78 113,805.84 133,141.03 82,653.12	8-3-21 8-1-21 9-26-20 9-16-21 6-27-21 6-20-21 1-10-22	J. A. Kreis & Co. J. A. Kreis & Co. W. E. Graham. Eagle Engineering Co. W. E. Graham—R. W. Curtis & Co. W. E. Graham—R. W. Curtis & Co. Gibson Construction Co.
Lee	4.53 12.65 14.00 10.04 11.32 9.8	G G H S G G G	18,240.64 126,717.70 272,089.78 123,893.99 111,931.05 95,501.80	10-29-21 81121 32022 81221 102021 102521	Lee. J. Smith Construction Co. Gibson Construction Co. T. W. Chandler & State Forces. Southern Dray Co. S. L. Davis—J. A. Kreis & Co. County Commissioners. Jameson Brothers—George, Hankins & George.
Burke Forsyth Caswell Rowan Stanley Montgom' Stokes	$ \begin{array}{c c} 3.58 \\ 12.22 \\ 11.93 \\ 2.543 \\ \hline \\ 11.60 \end{array} $	G G G H S Bridge	55,191.64 94,447.10 147,065.71 83,587.02 199,614.80 108,519.62	52121 81721 11221 31721 1922 11422	Southern Dray Co. C. E. Teague. C. B. Hester—Heilig & Sherrill. J. M. Gregory & J. E. Lane & Co R. M. Hudson & Co. Cornell-Young Co. Jameson Bros.—Rogers & Shumway. Mulligan & Roach.
	Lenoir Wake Mecklenburg Mecklenburg Forsyth Rowan Columbus Lenoir Buncombe Buncombe Buncombe Buncombe Survham Anson Nash Stanly Cabarrus Rutherford Rutherford Rutherford Rutherford Rutherford Rutherford Cleveland Montgomery Montgomery Montgomery Davidson Burke-McDowell Davie Pamlico Surry Surry Surry Surry Yancey Moore Lee Chatham Avery Randolph Duplin Hoke Madison Burke Forsyth Caswell Rowan Stanley Montgom' Stokes	Lenoir 7.234 Wake 6.811 Mecklenburg 6.008 Mecklenburg 4.59 Forsyth 5.868 Rowan 6.75 Columbus 11.025 Lenoir 7.88 Buncombe 3.43 Buncombe 3.76 Pitt 9.57 Nash 8.81 Durham 6.69 Anson 3.896 Nash 8.73 Stanly 2.803 Stanly 4.92 Cabarrus 1.35 Rutherford 2.206 Rutherford 9.64 Rutherford 9.64 Rutherford 10.26 Cleveland 1.645 Montgomery 11.07 Pender 26.11 Davidson 4.54 Burke-McDowell 8.33 McDowell 6.76 Davie 8.28 Pamlico 12.03 Surry 10.68 Surry 10.38 Yancey 2.95 Moore 8.75	Lenoir 7.234 H S Wake 6.811 H S Mecklenburg 6.008 H S Mecklenburg 4.59 H S Forsyth 5.868 G Rowan 6.75 G Columbus 11.025 G Lenoir 7.88 H S Buncombe 3.43 H S Buncombe 3.46 H S Buncombe 3.76 H S Pitt 9.57 G Nash 8.81 H S Durham 6.69 H S Anson 3.896 G Nash 8.73 G Stanly 2.803 G Stanly 4.92 G Cabarrus 1.35 H S Rutherford 2.206 H S Rutherford 9.64 G Rutherford 9.64 G Rutherford 10.26 G Cleveland 1.645 H S Montgomery 16.6 G Montgomery 11.07 G Pender 26.11 G Montgomery 11.07 G Pender 26.11 G Davidson 4.54 G Burke-McDowell 8.33 G McDowell 6.76 G Davie 8.28 G Pamlico 12.03 G Surry 10.68 G Sur	Lenoir	Lenoir

*Final Settlement Made With Federal Government.

STATUS OF STATE WORK IN NORTH CAROLINA

Projects Under Construction

NO.	NO. COUNTY LENGTH TYPE		APPROXIMATE COST	BEGUN	CONTRACTOR	
100 Beaufort 10 113 Chowan 10 114 Chowan 10 125 Edgecombe 11 137 Halifax 139 Halifax 151 151 Hyde 154		10.50 10.32 10.00 15.11 5.67 -4.30 11.27 20.00	H S G G H S H S Bridge G H S G G G G G G G G G G G G G G G G G G G	\$ 369,777.70 40,975.73 45,064.09 428,438.76 124,736.97 18,436.66 71,422.78 394,090.74 98,176.65 89,942.43	8-23-21 2-1-22 1-4-22 2-28-22 10-31-21 10-11-21 12-10-21 4-17-22 1-12-22 1-2-22	W. T. Hadlow. Nello L. Teer — P. R. Ashby. Battershill & Goode—Chandler & Ragland. R. G. Lassiter & Co. O. F. Leighton—A. C. House. Chandler & Ragland—Porter & Peck. C. W. Lacy—Porter & Peck. Sou. Willite Paving Co.—O. F. Leighton, Inc. J. P. Dicus—P. R. Ashby. J. A. Kreis & Co.
159 160 166 175 183B 185 186 191 195	Nash	9.83 0.47 9.50 14.35 9.75 6.91 15.18	G G H S Bridge G H S G G	53,722.95 17,954.75 217,405.72 32,343.30 31,069.72 260,816.60 57,934.41 65,619.35	$\begin{array}{c} 1-2-22\\ 1.27-21\\ 3-20-22\\ 4-6-21\\ 3-27-22\\ 3-28-22\\ 9-20-21\\ 1.20-22\\ 2-27-22\\ \end{array}$	Chandler & Ragland—Southern Dray Co. W. D. Murray-Sadler Corp. County Commissioners. B. J. Boyles. J. A. Marrow. Cheatwood & Driscoll. C. W. Lacy—M. M. Jones. L. M. Lee & Co.—B. J. Boyles.

STATUS OF STATE WORK IN NORTH CAROLINA --- Continued

Projects Under Construction (Continued)

639 G	l			10,000	Chair donsina		Jiminutu j		
Craves	NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	BEGUN	CONTRACTOR		
245 Jones 15.70 H S 224,737.90 3-22-22 Hydio & Baker 15.70 H S 280,301.20 3-27-22 Hydio & Baker 15.70 His 280,301.20 3-27-22 Hydio & Baker 15.70 His 280,301.20 3-27-22 Hydio & Baker 15.70 His 280,301.20 3-27-22 Hydio & Baker 15.70 Hydio 15.70 His 200,403.18 11-28-21 Hydio & Baker 15.70 Hydio 15.70 Hydio	$\frac{211}{218}$	Wavne-Duplin	9.93	H S	262,673.20 80,804.50	1-30-22 8-4-21	Union Paving Co. C. W. Lacy.		
	245 263 280	Jones Pamlico Wavne	$ \begin{array}{c c} 15.76 \\ 12.03 \\ 10.01 \end{array} $	H S H S H S	244,737.90 289,324.20 311,352.36	3-22-22 3-27-22	Hyde & Baker. Union Paving Company. Union Paving Co.		
Brunswick	291 300 301	Wilson Bladen Bladen	7.63 11.99 13.17	H S G G	203,493.18 65,178.90 82,028.21	48-22 $11-21-21$	P. R. Ashby. T. W. Chandler—Nello Teer. J. F. Mulligan—Powell Paving & Const. Co.		
Son	314 325	Brunswick	15.82 11.22	G	99,326.45	2.23-22	Works. Hagedorn Const. Co.		
Pender	339	Harnett-Cumb'l'nd	9.95	Bridge	16,524.75 44,631.40	11 - 30 - 21 $3 - 14 - 22$	Porter & Boyd. R. E. Martin.		
Roberson-Colum	376 377	PenderPender_Duplin	7.64 1.61	G G	94,757.85 76,985.70	111121 32222	A. W. McClay. C. G. Kershaw Const. Co.—Cornell Young Co. R. E. Martin-Hazell-Conerat-Quist Co.		
Durham	389 400 409	Roberson-Colum Chatham	0.5	G Bridge H S	83,463.38 57,420.22 6,140.64	$ \begin{array}{c} 10-26-21 \\ 4-14-22 \\ 1-13-22 \end{array} $	L. A. Chitwood. R. M. Walker & Co. J. P. Dicus.		
1454 Orange	411 427 436	Granville Harnett	$5.12 \ 21.19$	H S H S	$\begin{array}{c c} 211,574.92 \\ 159,097.62 \\ 144,318.14 \end{array}$	9-1-21 $12-1-21$ $6-28-21$	Hutton Eng. & Const. Co. R. G. Lassiter & Co. C. G. Kershaw Const. Co.—Hobbs & Kitchen.		
Wake	454 455	OrangeOrange	4.29 4.19 9.00	$_{ m G}^{ m H\ reve{S}}$	192,006.15 46,415.77	$6-18-21 \\ 11-28-21$	Elliott, Sholes & Teer. J. F. Mulligan Const. Co.—P. R. Ashby.		
10	481 482 492	Wake	6.64	H S H S H S	252,925.15 191.669.21	$\begin{array}{c c} 1-24-22 \\ 12-8-21 \\ 4-10-22 \end{array}$	Union Paving Co.—P. R. Ashby. R. M. Hudson Company. Porter & Peck.—A. C. House.		
11.70	505 511 525	Caswell Davidson	14.8 10.24	$\begin{array}{c} \mathrm{H} \; \mathrm{S} \\ \mathrm{G} \\ \mathrm{H} \; \mathrm{S} \end{array}$	$\begin{array}{c} 15,316.40 \\ 74,192.58 \\ 363,141.68 \end{array}$	$\begin{array}{c c} 4-17-22 \\ 12-12-21 \\ 12-23-21 \end{array}$	Hedrick Construction Co. White & Simpson—C. B. Hester. Elliott & Sons & Boggs—Austin Bros. Bridge Co.		
Total Color	532 533	Guilford Guilford_Forsyth	11.70 10.59 7.14	$egin{array}{c} \mathbf{H} \ \mathbf{S} \\ \mathbf{H} \ \mathbf{S} \\ \mathbf{G} \end{array}$	387,499.20 427,997.62	$ \begin{array}{c c} 2 - 1 - 22 \\ 7 - 11 - 21 \end{array} $	Elliott-Sholes Co. Royer-Ferguson Const. Co.		
Stanley-Anson	577 588	Moore Randolph Rockingham	$ \begin{array}{c c} 2.90 \\ 13.37 \\ 7.98 \end{array} $	H S H S	$\begin{array}{c} 411,375.77 \\ 266,498.43 \end{array}$	4-11-22 4-18-22 4-11-22	C. E. Teague. Royer-Ferguson Co., Inc.—J. L. Brinkley. Cheatwood & Driscoll.		
Gaston	606 607 622	Stanley-Anson Anson Catawba	6.39 10.85	Bridge G H S	54,759.32 40,517.29 354,684.88	32322 32122 12322	Concrete Steel Bridge Co. Geer & Wilson—Booz-Lloyd & Co. Union Paving Co.		
654 Mecklenburg 10.1 H S 302,887.09 4—3-22 Lampton & Burks 655 Mecklenburg 1.57 G* 20,000.00 12—21—21 Speed-Parker Co., Inc.—Luten Bridge Co. 657 Mecklenburg 13.8 G* 20,000.00 12—8-21 State Forces. 677 Scotland-Robeson 7.11 H S 283,460.21 4-26-22 P. R. Ashby—Chitwood & Palmer. 695 Union 4.3 H S 123,865.28 1-23-22 Redmon Const. Co. 700 Alleghany 7.90 G 132,297.33 6-23-21 W. E. Graham. 710 Ashe 3.14 H S 142,687.93 9—8-21 Pittman Const. Co. 725 Caldwell 2.4 G* 10,000.00 12-29-21 County Commissioners. 751 Stokes 7.25 G 31,746.00 10—4-21 J. F. Mulligan Const. Co.—Lee J. Smith. 780 Wilkes 14.50 G* 24,387.66 2-10-22 W. E. Graham. 781	632 638 639	Gaston Iredell Iredell	9.5 7.88 10.59	H S H S	291,868.94 244,509.30 387,448.42	1—2-22 10-12-21 1-2-22	Davis-Wilcox Const. Co. Thompson-Caldwell Co. R. M. Hudson Co.—Luten Bridge Co.		
677 Scotland-Robeson 7.11 H S 283,460.21 4-26-22 P. R. Ashby—Chitwood & Palmer. 695 Union 4.3 H S 123,865.28 1-23-22 Redmon Const. Co. 700 Alleghany 7.90 G 132,297.33 6-23-21 W. E. Graham. 701 Alleghany-Wilkes 8.00 G 153,863.60 6-16-21 W. E. Graham. 710 Ashe 3.14 H S 142,687.93 9-8-21 Pittman Const. Co. 725 Caldwell 2.4 G* 10,000.00 12-29-21 County Commissioners. 750 Stokes 14.86 G 93,054.48 9-15-21 J. F. Mulligan Const. Co.—Lee J. Smith. 751 Stokes 7.25 G 31,746.00 10-4-21 W. E. Graham. 780 Wilkes 18.00 G* 25,000.00 7-25-21 J. F. Mulligan. 781 Wilkes 14.50 G* 30,000.00 7-25-21 J. F. Mulligan. 782 Wilkes <	654 655	Mecklenburg Mecklenburg	$10.1 \\ 1.57$	H S H S	302,887.09 62,027.68	43-22 12-21-21	Lampton & Burks. Speed-Parker Co., Inc.—Luten Bridge Co.		
Tild	677 695 700	Scotland-Robeson UnionAlleghany	$7.11 \\ 4.3 \\ 7.90$	H S H S	283,460.21 123,865.28 132,297.33	$\begin{array}{c c} 4-26-22 \\ 1-23-22 \\ 6-23-21 \end{array}$	P. R. Ashby—Chitwood & Palmer. Redmon Const. Co. W. E. Graham.		
751	710 725 731	Ashe Caldwell Davie	$ \begin{array}{c c} 3.14 \\ 2.4 \\ 5.46 \end{array} $	H S G* H S	$\begin{array}{c c} 142,687.93 \\ \hline 10,000.00 \\ \hline 195,393.11 \end{array}$	$\begin{array}{c c} 9-8-21 \\ 12-29-21 \\ 3-13-22 \end{array}$	Pittman Const. Co. County Commissioners. G. R. Martin-Heilig & Sherrill.		
782	751 760 780	Stokes Surry-Wilkes Wilkes	$7.25 \\ 6.91 \\ 18.00$	G G G*	31,746.00 24,387.66 25,000.00	$ \begin{array}{c c} 10 - 4 - 21 \\ 2 - 10 - 22 \\ 7 - 25 - 21 \end{array} $	W. E. Graham. W. E. Graham. J. F. Mulligan.		
801 Avery	782 783 790	Wilkes_Watauga	5.97 34.40	H S G* H S	184,614.65 80,000.00	32922 92-21 42422	Hyde & Baxter. Chandler & Ragland.		
	801 811	Avery	0.99	HS	22,350.24	3-24-22	Geer & Wilson.		

STATUS OF STATE WORK IN NORTH CAROLINA --- Continued

Projects Under Construction (Continued)

NO.	COUNTY -	LENGTH	TYPE	APPROXIMATE COST	BEGUN	CONTRACTOR
823	Clevelan d	2.0	H S	\$ 81,234.01	12-22	Southern Paving Co.—Z. B. Weathers & Son.
833	Henderson	10.22	Ğ	38,412.44	1-3-22	S. L. Davis Const. Co.—Asheville Const. Co.
845	McDowell	7.19	Ğ	132,177.93	9-6-21	J. W. Stapp Const. Co.—Praytor, Howton Wood
			4	202,100	0 0 21	Const. Co.
846	McDowell	10.06	G	204,680.74	9-12-21	Asheville Const. Co.—W. T. Taylor Const. Co.
855	Mitchell	4.97	H S	174,393.78	9-12-21	Fiske-Carter Construction Co.
855B	Mitchell		Bridge	7,454.15	4-6-22	Luten Bridge Co.
856	Mitchell	4.0	HS	239,005.80	3-20-22	Porter & Boyd—L. J. Chandler & Co.
860	Mitchell		HS	152,908.42	4-21-22	J. F. Mulligan—W. H. Anderson Const. Co.
866	Polk	5.96	H S	180,393.40	4-3-22	Dunn & Woodall—Henry Const. Co.
877	Rutherford	9.79	G	64,563.73	5-31-21	Geer & Wilson.
878	Rutherford	6.55	G	50,913.50	92221	Michaux Const. Co.—Geer & Wilson.
979	Rutherford	:	Bridge	5,737.38	1-9-22	Austin Bros. Bridge Co.
880	Rutherford		Bridge	24,679.43	4-4-22	Austin Bros. Bridge Co.
503	Buncombe	2.58	HŠ	100,399.47	4-10-22	Asheville Paving Co.—R. C. Stevens.
904	Buncombe	1.60	HS	81,079.35	3-13-22	Asheville Paving Co.—R. C. Steven.s
910	Cherokee	7.56	G	76,743.59	5-24-21	Ross Bros.—W. T. Moore Conc. Prod. Co.
911	Cherokee	10.33	G	84,475.38	102521	H. A. Wells—Southern Dray Co.
920	Clay	4.8	G	54,875.81	1-9-22	E. A. Wilson & Co.—W. T. Moore Conc. Prod. Co.
921	Clay	12.37	G	123,929.52	10-24-21	Lee J. Smith Const. Co.—W. T. Moore Conc.
						Products Co.
930	Graham	12.90	G	130,522.00	101521	Lee J. Smith Const. Co.—C. M. Dicus.
940	Haywood	7.13	HS	126,082.00	4-14-22	Alexander & Patton—H. A. Brown & Co.
950	Jackson		G	145,313.30	6-13-21	Wright & Nave—O'Brien Const. Co.
960	Macon	4.97	- G	69,100.57	66-21	J. T. Plott—J. E. Lane & Co.
961	Macon	4.77	G	58,340.59	12-5-21	J. T. Plott—J. E. Lane & Co.
962	Macon	13.58	G	171,310.04	4-24-22	O'Brien Const. Co.—Griffin Const. Co.
970	MadisonYancey	13.80	G	267,378.26	10-11-21	R. H. Wright & Sons—O'Brien Const. Co.

Projects Completed

	209 500	CravenAlamance	2.65 5.22	H S	\$ 15,688.21 32,732.20	2-15-22 1-17-22	Eagle Engineering Co. W. W. Tuck & Son—A. M. Hazell, Connerate—
ı	500 692 722 844 942	Union Caldwell McDowell Haywood	5.22 2.28 7.00 1.80 0.57	H S G* H S	32,732.20 65,366.67 12,000.00 57,048.42 5,294.46	12-28-21 1-18-22 12-28-21	W. W. Tuck & Son—A. M. Hazell, Connerate— Quist Const. Co. Redmon Construction Co. County Forces. Bolton Construction Co. O'Brien Construction Co.
I							

^{*}Reconstruction only.

PROJECTS UNDER CONTRACT

NO. COUNTY		LENGTH	TYPE	APPROXIMATE COST	CONTRACTOR
38A	Halifax-North-				
0012	ampton	12.59	G	\$ 131,712.13	Nello Teer—Richards Bros.
.40	Halifax	12.00	Bridge	10,542.60	Von Glahn & Talbott.
196 272	Washington	14.93	G	82,099.60	W. N. Thompson—Nello Teer.
72	Sampson	16.47	G	98,807.39	R. E. Martin-Striblin-Stauddy & Newell.
26	Columbus	13.61	G	214,637.61	J. T. Plott—J. A. Kreis & Co.
378	Pender	13.59	HS	213,502.96	C. W. Lacy.
128	Granville	4.19	H S	142,637.77	Pittman Const. Co.
145	Lee	5.91	G	16,240.95	C. B. Hester.
183	Wake	0.54	HS.	19,989.75	C. D. Riggsbee.
493	Warren	3.88	HS	77,866.80	Porter & Peck.
503	Alamance	l	Bridge	59,450.38	Atlantic Bridge Co.
504	A amance	5.22	$\mathbf{H}\mathbf{\breve{S}}$	154,127.16	Elliott-Sholes Co.
538	Guilford		Bridge	7,555.90	J. L. Brinkley.
539	Guilford	0.6	$H \check{S}$	21,639.20	R. G. Lassiter & Co.
544	Hoke	10.45	G	32,445.49	O. A. Mann & Co.—J. T. Pigg.
300	Alexander	9.3	G	22,886.38	Bolton Construction Co.
529	Catawba	8.4	HS	268,662.48	A. L. Harris—R. M. Thurmond & Co.
647	Lincoln	7.10	H S	250,108.15	A. L. Harris—R. M. Thurmond & Co.
724	Caldwell	4.66	G	51,890.66	County Road Commissioners—R. M. Thurmond & Co.
951	Jackson	11.85	HS	249,546.00	R. H. Wright & Son —W. T. Moore Conc. Prod. Co.
980	Macon-Swain	17.9	G	344,161.29	E. A. Wilson & Co.—Southern Dray Co.
990	Transylvania	8.87	G	104,576.78	Sam. L. Davis Const. Co.—R. C. Stevens.

Summary									
	NUMBEI	R ÓF PROJ	ECTS	MIL	EAGE	APPRO	XIMATE TOTAL CO	OST	
	нѕ	' G	BRIDGE	нѕ	G	нѕ	G ,	BRIDGE	
UNDER CONSTRUCTION Federal Aid Projects State Projects	2 54	21 54	1 11	$9.25 \\ 372.78$	241.34 553.47	\$ 195,816 88 11,753,291 34	\$2,767,039.06 4,103,848.36	\$ 332,308.83 299,780.88	
Total Under Construction	56	75	12	382.03	794.81	11,949,108.22	6 870,887.42	632 ,089 .71	
UNDER CONTRACT Construction not yet begun Federal Aid Projects State Projects	9	10	3	55.37	114.69	1,398,080.27	1,099,458.28	77,548.88	
Total Under Contract	9	10	3	55.37	114.69	1,398,080.27	1,099,458.28	77,548.88	
COMPLETED Federal A'd ProjectsState Projects	29 3	60	3	143.18 6.73	521.46 12.79	4,745,739.45 238,103.30	4,631,520.32 50,026.66	309,637.70	
Total Completed	32	63	3	149.91	534.25	4 ,983 ,842 .75	4,681,546.98	309,637.70	
Total mileage of Hard Surface wor Total mileage of Topsoil, Sand Cla Total mileage under cons	y or Gra	vel work	under co	nstruction	or conti	racted for		437.40 909.50 1,346.90	
Total cost of Hard Surface work u Total cost of Topsoil, Sand Clay o Total cost of Bridge work under c	r Gravel	work und	der constr	uction or	contracte	ed for		13,347,188.49 7,970,345.70	
Grand Total cost of work	c under o	constructi	on or con	tracted fo	r		\$	21,317,534.19	
Total mileage of Hard Surface work completed 149.9 Total mileage of Topsoil, Sand Clay or Gravel work completed 534.2									
Total mileage of work completed 684.1									
Total cost of Hard Surface work of Total cost of Topsol, Sand Clay; of Total cost of Bridge work complete	or Gravel	work co	$mpleted_{}$					4,983,842.75 4,681,546.98 309,637.70	
Grand Total of all work	complete	d		***	ar are the two the tips ago as			9 ,975 ,027 . 43	
Corrected to May 1, 1922.									



LAYING A ROCK ASPHALT WEARING COURSE ON SLOANS FERRY BRIDGE—A PART OF NORTH CAROLINA'S MAINTENANCE PROGRAM
CONSISTS IN RECONSTRUCTING AND REPAIRING THE BRIDGES ON THE STATE HIGHWAY SYSTEM

Contracts Awarded April 15th

F THE 7 projects upon which bids were opened on April 25th six were awarded as follows:

J. T. Platt, of Greensboro, was awarded the grading and surfacing with sand-clay of Project No. 326, Columbus County, while the structures on the same project were awarded to J. A. Kreis & Co., of Knoxville, Tenn. The project consists of 13.61 miles of the Wilmington-Charlotte-Asheville Highway, located between Waccamaw Station and Freeman. The work will cost approximately \$215,000.00 and will require 300 working days for completion.

The Atlantic Bridge Company, of Roanoke, Va., were successful bidders on Project No. 503, Alamance County. This consists of the construction of an up to date bridge over Haw River at Haw River Station and will replace the present steel bridge which is very unsatisfactorily located. The new bridge, which will cost in round figures \$55,000 will be so located and designed as to eliminate the present steep and dangerous decline approach to the eastern end of the bridge. This structure is located on the Central Highway, Route No. 10, and carries a large amount of both local and through traffic.

The Atlantic Bitulithic Co., of Richmond, were awarded Project No. 446, Lee County, consisting of 6 miles of asphaltic concrete pavement from Sanford

towards Carthage. O. A. Mann & Co., of Lagrange, Ga., were awarded the structures on the same project, the total cost of construction being approximately \$173,000.00.

Project No. 600, Alexander County was awarded to the Bolton Construction Co., of Marion, N. C. The work is located between Taylorsville and the Iredell County line, a distance of 9.3 miles, and will be surfaced with topsoil at an approximate cost of \$11,500.00.

A. L. Harris, of Dillsboro was low bidder on the choice offering of the letting and was awarded Projects 629 and 647 in Catawba-Lincoln counties. These projects combined form a link 15.5 miles in length from Newton to Lincolnton and it was decided that the work could be more expeditiously carried on if awarded as a single contract. The project will be graded and surfaced with plain concrete by Mr. Harris, and the structures built by R. N. Thurmond & Co., of Lynchburg, Va., at a cost of \$468,000.00.

Project No. 990, Transylvania County, consisting of 8.87 miles of road between Brevard and Rosman, will be graded and surfaced with waterbound macadam and gravel by the Sam L. Davis Construction Co., of Greensboro, and the structures built by R. C. Stevens, of Asheville, for \$151,000.00.



A scientifically prepared coal tar for the construction and maintenance of roads and streets.

YOUR INQUIRIES ARE SOLICITED

AMERICAN TAR PRODUCTS COMPANY



208 SOUTH LASALLE STREET CHICAGO

J. WILSON WOOD

North Carolina Sales Agent Raleigh, N. C.



SLAUGHTER CULVERT COMPANY

300 - 301 Masonic Temple

RALEIGH



Metal Culvert

Concrete Culvert

Washed and Screened Sand Gravel Crushed Stone

Conforming to the specifications of the North Carolina State Highway Commission.

Prompt shipments by rail or water

Favorable freight rates to all North Carolina points.

Quotations gladly furnished on request.

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GOOD MATERIAL

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GOOD ROAD

IS ESSENTIAL

LEHIGH PORTLAND CEMENT

has been used in the construction of some of the best highways in the country because of its

Quality and the Service of the

LEHIGH PORTLAND CEMENT COMPANY

ALLENTOWN, PA. RICHMOND, VA.

OFFICES and MILLS
from
COAST to COAST



A RUSSELL ROAD MACHINE FOR EVERY NEED

Before deciding upon a road machine let us assist you by suggesting what we consider best for your requirements. We make this offer because we know that this is one of your problems. The first thing to decide upon is whether you want a machine for construction or maintenance; for horse power or tractor power.

For Construction buy the largest ma-

chine for which power is available. The Russell Mogul with a 12-foot blade and a 25-horse power tractor will construct your roads most economically.

The Russell Reliance, with a 10-foot blade, ranks next to the Mogul. With this machine we suggest at least a 20-horse power tractor.

The Russell Special is a combination machine for which you may use a 15-horse power tractor or 8 or 12 horses. It is equipped with an 8-foot blade and is often preferable over the Standard for use with animal power in stony or stumpy soil.

The Russell Standard is an 8-horse machine and is, no doubt, the most popular machine for road construction with animal power. This machine

may also be equipped with engine pole for those having a small 8 to 15-horse power gas tractor. It has a blade 7 ft. 3 in.

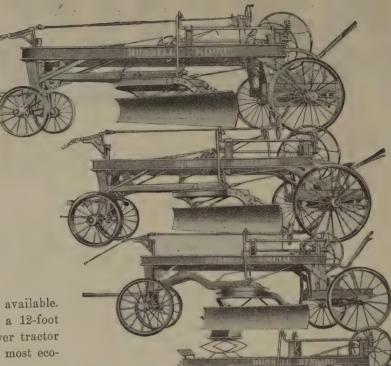
For Maintenance the first thing to decide is whether you want a four-horse machine for two men, or a two-horse machine for one man.

For those who are willing to put four horses and two men on the grader, the *Russell Junior* will do maintaining work more effectively than any other grader. This machine has a 6-foot blade and may be used for light road construction as well as maintenance.

The Russell Hi-Way Patrol grader is built especially for greatest efficiency in patrol and maintenance work with two horses and one man. It is lighter than the Junior and is equipped with a 6-foot blade. Blade is operated by worm and gear lift, giving the finest kind of adjustment.

The Russell Gem is the cheapest of the high-framed type machines. It is equipped with 5-foot, one-piece, reversible blade. The blade is operated by lever. It is a one-man, two-horse machine.

E. F. CRAVEN, "THE ROAD MACHINERY MAN", GREENSBORO, NORTH CAROLINA COMPLETE LINE OF MACHINES AND REPAIRS IN STOCK



Russell Road
Machines
have the
Largest
Capacity; the
Lowest Rate
of Up-keep
and are fully
Guaranteed.

Catalog and prices on request.

We are Distributors for Virginia, North and South Carolina for the Following New Equipment:

Air Compressors, Locomotives, Street Cleaning tools and machines, Road pumps, Trench pumps, Steam pumps, Sand pumps, Steam, electric and gasoline hoists, Cranes of all types, Fire apparatus, Asphalt tools, Motor trucks, Trailers, Pavers, Building Mixers, Light mixers, Concrete chute systems—complete, Mortar mixers, Saw rigs, Graders, Asphalt pumps and distributors, Dump bodies, Conveyors, Elevators, Road Graders, Crushers, Scarifiers. fiers.

We have a full line of used machinery a great deal of which is owned outright by us and has been fully rebuilt in our own shops in Norfolk.

If you want anything in the way of used machines that must be about as good as new write us.

At this time we have going through our shops, rebuilding, the following:

Ten ton steam roller, Five ton tandem roller, One bag light mixer, $3\frac{1}{2}$ ton Kelly Truck, Monarch Tractor, Three hoisting engines, Two air compressors, Pipe thread-

ing machine, 44 ins. engine lathe, 5 ton Alco Truck, 5 drill presses, No. 3. Keystone shovel, one paving mixer, etc., etc.,

We have a full line of slightly used plants on which we can save you morey.

Let us have your inquiries.

We have a number of good pieces of plant that we will rent to responsible people.

This will save you buying equipment for the small contracts.

We have to rent now: No. 3 Keytone Hoisting engine D. C. 7 x 10, D. D. with boiler. Ten ton steam roller, Five ton tandem roller, 30 h. p. crawler type traetor, Thew Steam shovel, Two small air compressors with gasoline engines, Air compressor with electric motor, 21-S Mixer with boiler, engine, sideloader and tank, One-bag gasoline mixer loader and tank, 1250 yard Asphalt plant-complete.

All above plant is our own property and fully guaranteed.

Write us for terms.

We can use a few good sub-agents in the larger towns in all three states. If you visit contractors and can sell machinery we can put you in position to make some good extra money.

Sixteen years in business — our customers our references

LEWTER F. HOBBS, INC.

NORFOLK, VA.

Offices and show rooms 113-115 East Twelfth St. Private Telephone Exchange 23908

Machine shops 835-837 West 38th. St.





Permanent Concrete Minimum Maintenance Solves the Road Problem

The concrete road is gaining in favor in all parts of the United States. Whether laid in North or South, East or West, in all varieties of climate and under widely varying conditions, the concrete road is meeting with success and is solving the problem of securing a roadway at reasonable cost that will stand up under modern traffic conditions.

Public approval and appreciation of the concrete road is based upon practical observation as to its extreme utility, reasonable first cost and the almost negligible outlay required for maintenance.

The most important question in road building today is that of maintenance.

The one aim and desire of road officials and engineers has been to find a material, the use of which would keep maintenance charges at a minimum.

In Bellefontaine, Ohio, the maintenance cost of a concrete road put down 20 years ago has averaged only one-fourth of a cent per square yard per year.

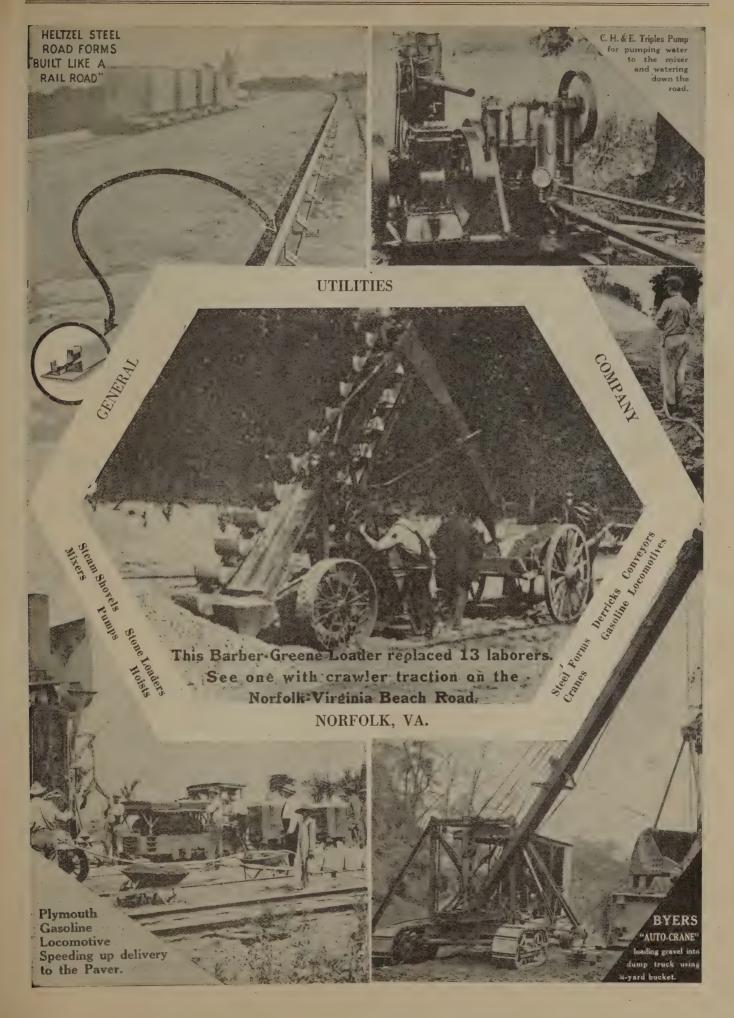
In Wayne County, Michigan, the maintenance on 60 miles of concrete road laid 1909 to 1912 was less than one-sixth of a cent per square yard for three years.

Concrete, therefore, completely answers the maintenance question.

And this combined with reasonable first cost makes it the ideal material for a modern road to meet modern conditions.

CLINCHFIELD PORTLAND CEMENT CORP.

Office and Mills: KINGSPORT, TENN.



GEO. E. HOPPE, PRES.

GRAHAM B. BRIGHT; V.-P. and SALES MGR.

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We Offer You the Following Lines:

HOLT "CATERPILLER" TRACTORS

LAKEWOOD ENGINEERING CO.

LAKEWOOD MIXERS
LAKEWOOD-MILWAUKEE MIXERS
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MORTAR MIXERS
CONCRETE PLACING PLANTS, TOWERS,
HOPPERS, BUCKETS, CHUTES, BIN
GATES, ETC.
CONCRETE CARS AND BUGGIES
STEEL ROAD FORMS

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INDUSTRIAL CARS AND TRACK

GAS SHOVELS DRAGLINES SKIMMER SCOOPS CRANES
DERRICKS
BACK FILLERS

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AUSTIN WESTERN ROAD MACHINERY CO.

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PAWLING & HARNISCHFEGER CO.

BAKER MANUFACTURING CO.

Baker--Maney Wheelers

We also offer a full line of Slow Speed Trailers for all purposes; in fact, anything it takes to build or maintain a Street or Road.



Mr. Addison Hewlett, Chairman of the Board of Commissioners of New Hanover County, N. C., writes, under date of July 25, 1921:

"We have been using Tarvia for surface treating the macadam roads of New Hanover County for the past six years, and we find this treatment satisfactory in every respect.

"Before we started the use of Tarvia we had great difficulty in maintaining our roads, as they became very dusty in dry weather and washed away in wet weather, leav-

ing our road surface full of holes and ruts. Since using Tarvia the surface of the roads has been well protected in all kinds of weather, and today our roads have smooth, hard surfaces and our maintenance problem has been very easily solved. The Tarvia treatment is very inexpensive.

"It is unquestionably the best investment the Board of Commissioners has ever made and the Commissioners would not consider for a moment discontinuing Tarvia on our roads." Additional comments on Tarvia are made by R. A. Burnett, County Superintendent of Roads:

> "Tarvia treatments are given to some of our roads every year while other roads, such as the Wrightsville Turnpike, have lasted as long as three years before requiring another treatment.

> "These treatments have cost us in the neighborhood of \$300 per mile per year and have proved to be the best, easiest and cheapest

method of maintaining our roads. We have always had the best of co-operation from your engineers . . .

"We feel that we have a finer system of roads than any other county in the State."

No matter what your road problems may be—new construction, maintenance, or repairs—there is a grade of Tarvia made especially for the purpose.

Write for free illustrated booklet describing the various uses of Tarvia

36th and Grey's Ferry Avenue The Barrett Company

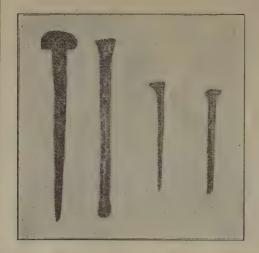
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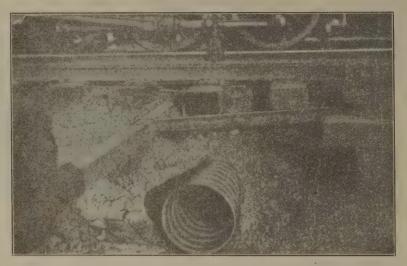


PHILADELPHIA, PA.



PURE IRON LASTS LIKE THIS

Pure iron nails from coffin of soldier buried at Fort St. Clair, Ohio, U. S. A. After being 100 years in the ground, they are practically undamaged by rust. Analysis shows them to be 99.83% pure iron, containing only the merest traces of carbon, copper and sulphur.



The Engineer of the Atlanta Terminal Company says that the Armco Culvert pictured here is in such good condition today that it ought to last several times the ten year period during which it has already withstood the acid waters which go thru it in the Railroad yards, as well as the pounding of the 450,000 heavy trains which have gone over it.



THE DIXIE CULVERT AND METAL COMPANY

Little Rock, Ark.

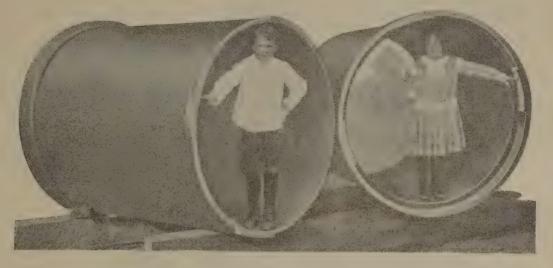
ATLANTA, GA.

Jacksonville, Fla.

J. GRANVILLE BALDWIN, Charlotte, N. C. W. H. McNEILL, Lakeview, N. C.



Long Years of Life Ahead of Them



National Lock - Joint Cast - Iron Pipe

The Pipe of Short Units, Long Service and Low Costs

The Pipe that locks effectively, that prevents Separation and assures alignment to perfection.

The pipe which solves culvert renewal problems with least expense, greatest efficiency. The pipe that does not rot or disintegrate, the pipe that is mechanically correct and has proved itself the solution of the culvert problem.

CONTRACTORS and ENGINEERS, GET THIS:

TWO MEN, without the use of any tools whatsoever, will unload, handle and install all sizes up to and including 36 inches in diameter.

It is as cheap to handle and install as clay pipe WITH NO BREAKAGE LOSS. In shallow trench work the entire culvert can be built up, interlocked and rolled into place in one operation.



A M E R I C A N CASTING CO.

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T. B. TURNER & CO.

Raleigh, :: North Carolina

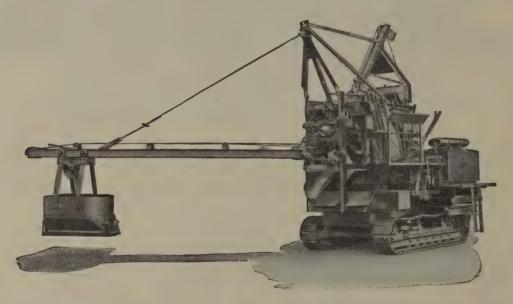


FOOTE BUILT THE FIRST PAVER WITH CATERPILLAR TYPE TRACTION

And having gone entirely through the experimental stage now offers to contractors the perfected "MultiFoote"

CONSIDER THESE FEATURES:

- 1 No planking or delays in moving, made possible by full length cast steel self-cleaning tread.
- 2—Absolute one-man control; from high operating platform, thus giving operator full view of all operations.
- 3—Fast mixing and discharging, due to patented double cone drum
- 4—Thoroughly dependable heavy duty skip hoist, (developed from suggestions of North Carolina contractor.)



"A MultiFoote User is a MultiFoote Booster"

Built in two sizes---14 E and 21 E, with boom and bucket or gravity chute with steam or gas power

GENERAL SOUTHERN AGENT
BURTON FRANKLIN, Chattanooga, Tenn.

NORTH CAROLINA AGENT
E. F. CRAVEN, "The Road Machinery Man," Greensboro, N. C.

Alabama begins a big Federal Aid Program of Highway Construction



28 miles of Asphaltic Slag Concrete Roads

F. A. P. No. 82 (Cullman County)—8 miles of Asphaltic Slag Concrete 18 ft. wide; 2-inch wearing surface on 6-inch waterbound slag macadam base; road runs from Cullman to Guntersville, Ala.

F. A. P. No. 83 (Morgan County)—10 miles of Asphaltic Slag Concrete; continuation of F. A. P. No. 82 which runs from Cullman, Ala., to Guntersville.

F. A. P. No. 106 (Etowah County)—10 miles of Asphaltic Slag Concrete, 16 ft. wide, from Gadsden to St. Clair County line.

27 miles of Penetration Slag Macadam Roads

F. A. P. No. 88 (Marshall County)—18 miles of Penetration Slag Macadam, 18 ft. wide, 2½ inch wearing surface. This road is on Dixie Highway and extends from Tennessee river to Boaz, Ala.

F. A. P. No. 76 (Sumter County)—9 miles of Penetration Slag Macadam, 16 ft. wide; 2½ inch wearing surface on 6-inch waterbound slag macadam base; this road runs from Livingston, Ala., toward the Tombigbee river.

It's a significant fact, isn't it, that most of the roads that have been built—or that are being built—under State and Federal Aid direction are "Slag-built" roads.

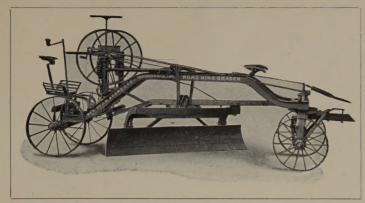
Birmingham Slag Company

Slag Headquarters for the South

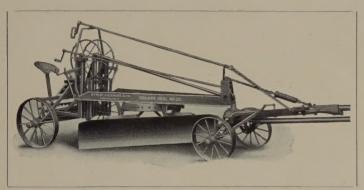
ATLANTA, BIRMINGHAM, THOMASVILLE



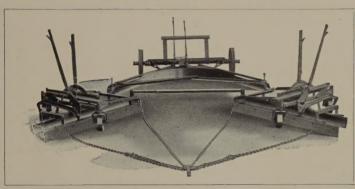
MOST MILES OF GOOD ROADS PER DOLLAR



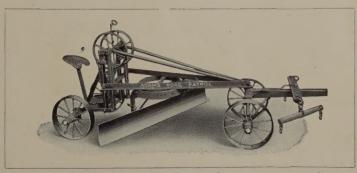
ROAD KING GRADER, 8-FOOT BLADE



SQUARE DEAL No. 2-C, 7-FOOT BLADE



ADAMS ROAD MAINTAINER



ADAMS ROAD PATROL SCRAPER

translated into working terms means Adams Road Building and Maintenance Equipment

For your road building grading use

ADAMS ADJUSTABLE LEANING WHEEL GRADERS

that are guaranteed to do more work for you with less power and therefore less cost, than any other graders on the market. The difference is in the leaning wheels—an exclusive feature on Adams Graders.

They are built with blades ranging from 7 ft. to 12 ft. long. There's a size to suit your work that can be furnished either for animal or tractor power.

To keep your roads always smooth and properly crowned, use

ADAMS ROAD MAINTAINER

a flexible machine which shapes both sides and crowns the center of the road in one operation, preserving the original contour of the road. Operated by one man and a truck or light tractor, it covers many miles of road a day, making the maintenance cost per mile very low. Adjustable to all road widths and conditions.

ADAMS ROAD PATROL

a mighty popular little one-man, two-horse maintenance machine for maintaining roads by the patrol system. Thousands in use all over the country.

We also manufacture a superior line of Road Drags, Scarifiers, Scrapers, Plows, etc.

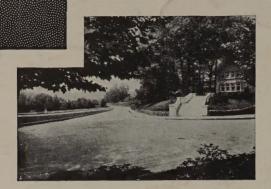
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J. C. BENJAMIN, RALEIGH, N. C.
733 W. HARGETT ST.

J. D. ADAMS & COMPANY
HOME OFFICE AND FACTORY
INDIANAPOLIS, INDIANA

GET IN TOUCH WITH OUR LOCAL DISTRIBUTOR — HE IS THERE TO SERVE YOU

ASHEVILLE



TEXACO Asphaltic Concrete in the famous Grove Park Section of Asheville, N. C. This pavement was built in 1917 on old macadam.

To combine beauty with durability. That was the paving problem in Asheville, N. C., America's famous resort. This problem was solved successfully by laying TEXACO Asphaltic Concrete.

Asheville now has thousands of square yards of durable, resilient TEXACO pavements, which harmonize in beauty with the entrancing scenic surroundings.



Another view of the TEXACO Asphaltic Concrete in Asheville, N. C., which was constructed in 1917.

Just as Asheville selected TEXACO pavements, so have many other world-famed resorts found TEXACO the most durable and serviceable.

Atlantic City and Long Branch in New Jersey, Mineral Wells in Texas, Florida's far-famed resorts, and many others have pavements that last—made of TEXACO Asphalt.

TEXACO



The Texas Company

Asphalt Sales Dept., 17 Battery Pl., New York City



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